

M&R

M&R Plan

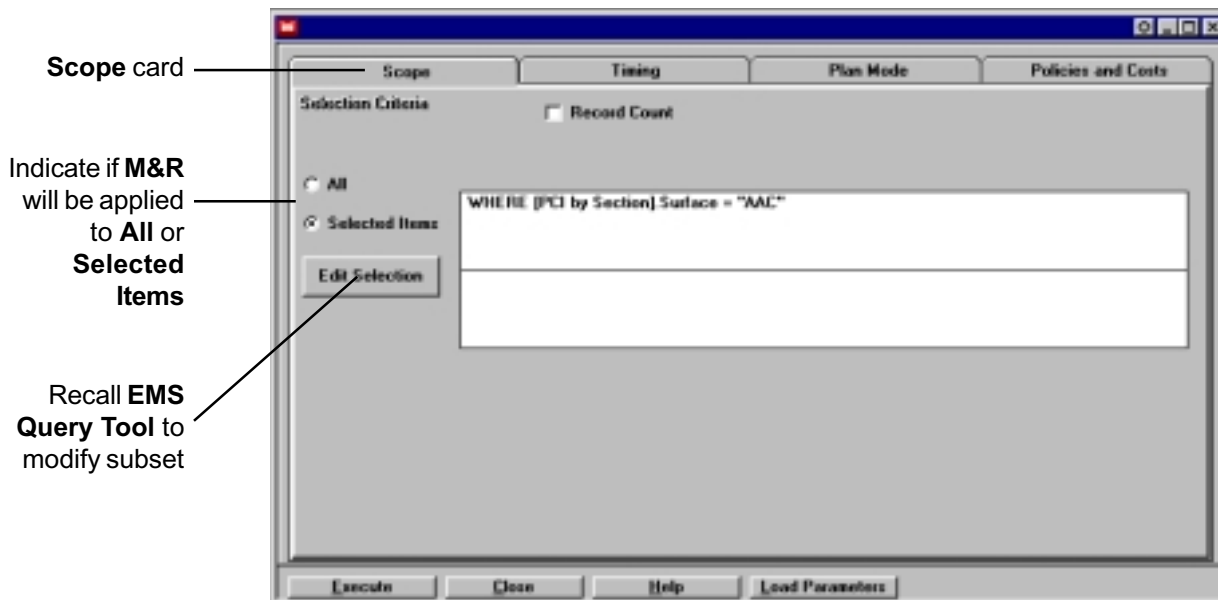
Configuring the M&R Report

The PAVER **Work Plan** is a tool for planning, scheduling, budgeting and analyzing alternative pavement maintenance and repair (M&R) activities. The M&R plan utilizes basic inventory data combined with inspection information, maintenance policies, maintenance costs, and predictions about future pavement condition. **Work Plan** results are specific to your site. All factors used in determining future M&R or construction activity or the associated costs can be configured to reflect your pavement management practices and costs.

The **Work Plan** report operates like the **Condition Analysis** report. When you start the report, a four tab parameter collection window appears on the screen. When the **Work Plan** report is configured, you execute the report and view the results in the **Report Viewer**.

Tab 1 - Scope

The **Work Plan** parameters are configured through the **M&R Plan** module on the PAVER button bar. The **Work Plan** configuration window uses an index card style form with the **Scope** card appearing first. The **Work Plan** report can be applied to all the sections in your database or you may specify a subset of records. To analyze all sections in your database, use your mouse to select **All**. To analyze a subset of your pavement sections, click on **Selected Items**. The **EMS Query Tool** is launched immediately for you to indicate the subset of pavements that you would like to use. When you specify the **Selected Items** option, a new button, **Edit Selection**, appears on the **Scope** card. If you wish to edit your selection later, clicking this button invokes the **EMS Query Tool** for you to update your selection. As always, the **Record Count** check box shows the current section count based on the specific query you are working with.



Tab 2 - Timing

Note

Selecting the **Consequence Model** option on the **Plan Mode** tab automatically forces the **Years** value on the Timing tab to "1".

The Timing card is used to specify the start date and number of years the plan will encompass. Entering the **Start Year** for the **Work Plan** and the number of **Years** to analyze specifies report duration. The **Start Year** field must be entered in mm/dd/yyyy format. **Years** is simply a numeric value with 1 as the minimum.

Tab 3 - Plan Mode

Three variations of the **Work Plan** can be used. The first, **Critical PCI Method**, optimizes M&R activity against a specified budget or determines the budget needed to maintain a specified condition level. The second, **Minimum Condition**, measures costs but rations M&R by pavement condition. The third, **Consequence Model**, measures the impact of a localized M&R action over the first year.

To select **Critical PCI Method**, highlight its radio button. Next, select the policies you wish to use in the work plan. The **Localized < Critical** option is used to indicate the use of **Safety M&R** policies. The **Localized < Critical** is used to indicate the use of **Preventative M&R** policies.

Hint

You can create a budget of \$100,000/Year and use the Budget multiplier feature in the **M&R Work Plan**.

Below the maintenance policies are the **Determine Budget Consequence** option and the **Determine Budget Requirements** (Iteration) option. Selecting **Determine Budget Consequence** optimizes M&R activity against a specific budget. The drop-down box next to **Budget** is used to specify one of the PAVER M&R budget tables to use with the report. The **Edit** button is used for reviewing and editing the selected budget table or for creating a new table. **Major M&R Priority** lets you set the hierarchy for determining which pavement type and which condition range gets repaired first. To edit or add a new priority table, select the **Edit** button. See **System Tables** for further instructions on creating or editing **Budget** or **Major M&R Priority** tables.

Note

M&R tables are also accessed through the PAVER Menu. Under the **Tables** menu, select **M&R Plan Tables**.

Selecting **Determine Budget Requirements (Iteration)** allows you to choose between **Backlog elimination in x years** or **Condition Stabilization**. Note that x changes as the work plan duration is changed in the **Timing** tab in **Backlog elimination in x years**. When **Condition Stabilization** is chosen, two more options appear. You must specify either **Maintain Current Area Weighted PCI** or **Reach Preferred Area Weighted PCI**. Finally, specify the maximum number of iterations that PAVER uses to calculate the goal.

The **Minimum Condition** option lets you set the lowest pavement condition (PCI) that is allowed for each pavement rank (**P** - Primary, **S** - Secondary, **T** - Tertiary, etc.). To edit or add a new **Minimum Condition** table, see **System Tables**.

The **Consequence Model** calculates the cost and resulting condition of immediate implementation of local M&R for the year of the most recent inspection. Note that choosing **Consequence Model** changes the work plan duration in the **Timing** tab to one year automatically.

Select desired
M&R policies

Select budget
options

Select **Budget**
and **Priority**
tables

Scope Timing Plan Mode Policies and Costs

☐ Critical PCI Method

☒ Localized < Critical ☒ Localized > Critical ☐ Global ☒ Major M&R

☒ Determine Budget Consequence ☐ Determine Budget Requirements (Iteration)

Budget Consequence Options

Budget: Unlimited by Year Edit

Budget Scale Factor: 1.0

Major M&R Priority: Default Priority Table Edit

☐ Minimum Condition

☐ Consequence Model

Execute Close Help Load Parameters

Minimum
Condition
option

Select and Edit
**Minimum
Condition**
tables

Scope Timing Plan Mode Policies and Costs

☐ Critical PCI Method

☒ Minimum Condition

Minimum Condition: Default Minimum Condition Edit

☐ Consequence Model

Execute Close Help Load Parameters

Tab 4 - Policies and Costs

Work Plan maintenance policies and work costs are configured on the **Policies and Costs** card. Notice that if the maintenance policies below **Critical PCI Method** were chosen on the Plan Mode tab, the same policies are active on this tab.

The drop-down boxes, positioned by the **Localized** repair options, are used to select the maintenance policy to apply for **Policy < Critical** and **Policy > Critical M&R**. Associated with each maintenance policy is a cost table. You may accept the default selection or specify a custom cost table. The maintenance policies and cost tables are defined in data tables that can be created or edited by clicking on the **Edit** button that corresponds to the table you are working with, or through the **Tables** selection on the PAVER Menu.

Different global maintenance work types can be specified for minimal, climate related, and skid causing types of distresses. The pick lists associated with the three global maintenance labels show the available global repair options and the **Interval** (policy application interval), **Delta** (improvement in the condition as measured by years until condition returns to the current state), and **Cost** (per unit of pavement) associated with each repair option. You may select "none" from the list if you do not wish to perform one or more of the three types of global maintenance.

To edit the global maintenance lists, again click on the corresponding **Edit** button or choose **Tables>M&R Plan Tables>Global M&R** from the PAVER Menu. PAVER will display the information to be edited using the **Tab Table** editor. There are two tables of information used to describe global M&R work. These two tables are **Work Types** and **Cost**. To change existing work type description information, simply click on the work type information field desired, and enter the new information. Similarly, to change existing cost information, select the tab for **Cost**, then select the desired **Cost** table using the drop-down box at the top of the **Cost** card, and edit the information directly on the grid. Several different **Cost** tables may be used in PAVER, even for the same work items. This is because costs may vary depending on whether they are done in-house or by contract, as part of a small job or part of a very large one, for example.

To add new **Global M&R** table information, you must first understand the relationship between the tables used for **Global M&R** work. The **Work Types** card is the master table. In order for cost information to be entered, there must first be a **Work Type** entry. **Cost** information can be entered for any of the work types in the **Work Types** table. Often, cost information will be added only for those work types which you expect to use in your **Work Plan**. When you choose to add a record in the **Cost** table, you are asked to choose an existing work type from a list of **Work Types** already defined. Therefore, if you add a new work type description to the **Work Types** table and then go to the **Cost** table and choose to add a new cost item (using the **Add** button), you will see that your new work type is now on the list of **Work Types** available to add cost information.

In addition to adding work type descriptions to the **Work Types** table, and cost information to an existing **Cost** table, you may also create new named **Cost** tables using the **Add Table** button on the **Cost** card. When you first create a new **Cost** table, it will be empty, without any information on any work types. Use the **Add** button on the **Cost** card to create new records (i.e. rows of cost information) for any work types you desire in your new **Cost** table.

Major M&R is performed on sections, which have structural distresses at the time of the last inspection. Major M&R is generally only performed on sections with a PCI below the critical PCI or sections that will fail prematurely due to design or construction deficiencies. A different start date option is provided for Major M&R to accommodate design preparation or seasonal delays.

Note

You may create multiple **M&R Cost by Condition** tables.

The cost of Major M&R is determined by the PCI at the time the work is performed. The Cost by Condition table specifies the cost of various categories of repair, including Major M&R. To Edit the Cost by Condition tables select **Tables>M&R Plan Tables>Major M&R** from the PAVER Menu. Select the **Cost by Condition** tab from the **Major M&R** table to set the per unit cost of Major M&R. The **Cost by Condition** table used in the **Work Plan** is specified at the top of the **Maint. Policies** card on the **Work Plan** form in the **M&R Plan**.

There is an option to **Apply Policies in the First Year**. You may check this box if you would like the localized policies to be utilized in the first year of the M&R plan. Otherwise, in year two and beyond, the **M&R Cost by Condition** table selected will determine localized policies. Also, there is an option at the top of the card to apply an inflation rate. Check this box and input the desired rate.

Once the **Work Plan** has been configured, clicking the **Execute** button located on the bottom of the **Work Plan** configuration form launches the process.

The screenshot shows the 'Policies and Costs' tab of the 'M&R Plan' configuration window. The window has four tabs: 'Scope', 'Timing', 'Plan Mode', and 'Policies and Costs'. The 'Policies and Costs' tab is active, showing settings for 'M&R Cost by Condition (Year2..n)', 'Localized' policies, 'Global' policies, and 'Major M&R' start year.

Annotations with arrows point to specific fields:

- Select Localized M&R policies and costs:** Points to the 'M&R Cost by Condition (Year2..n)' dropdown menu.
- Select Global M&R policies and costs:** Points to the 'Global Cost' dropdown menu.
- Select Start Year for Major M&R:** Points to the 'Major M&R Start Year' text box.

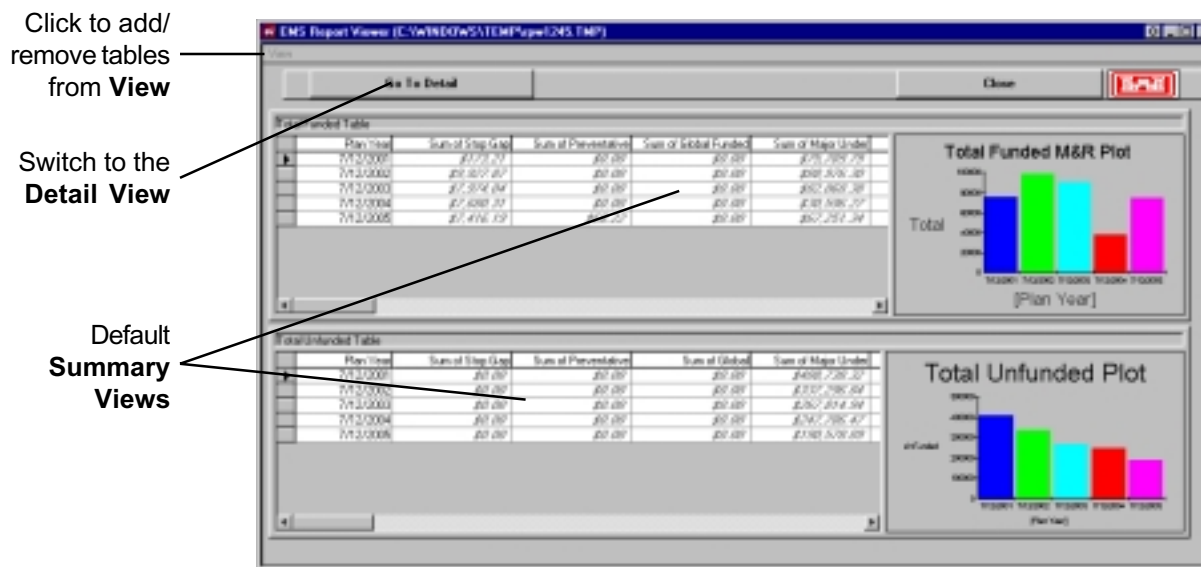
The 'Policies and Costs' tab contains the following fields and options:

- Apply Inflation Rate:** A checkbox and a text box for the inflation rate.
- M&R Cost by Condition (Year2..n):** A dropdown menu with 'Default Cost by PCI Range' selected, and an 'Edit' button.
- Localized:** A section with a checkbox for 'Apply Policies in First Year'.
- Policy < Critical:** A dropdown menu with 'SAFETY M&R, ROADS (DEFAULT)' selected, and an 'Edit' button.
- Policy > Critical:** A dropdown menu with 'PREVENTIVE, ROADS (DEFAULT)' selected, and an 'Edit' button.
- Global:** A section with a dropdown menu for 'Global Cost' and an 'Edit' button.
- Major M&R:** A section with a 'Start Year' text box (containing '7/11/2001') and a checkbox for 'Show Major M&R backlog in interim'.

At the bottom of the window are buttons for 'Execute', 'Close', 'Help', and 'Load Parameters'.

Analyzing M&R Activity

Once you have configured the **Work Plan** report, click the **Execute** button to start calculating the report. When the report calculations are completed, the **Work Plan** report is presented in the **Report Viewer** tool. The default presentation of the report is a summary of the **Work Plan** that includes two tables with corresponding graphs. The summary view includes the **Condition Distribution Graph** (No. of Sections), that shows a breakdown of the number of sections in each condition category - for each year of the report. **The Condition Table** is accompanied by a graph that plots the conditions over time. The other default table/graph is the **Total Funded** table. This shows the totals of funds spent for each year of the plan - broken down by work category (e.g. Localized, Global, etc.). **Additional Summary Work Plan** tables are the **Summary Table** and the **Applied Policy Summary Table**.



Summary View Section

The **View** menu on the PAVER Menu is used to add or remove tables and their associated graphs from the report viewer screen or to switch between the **Summary** and the **Detail** version of the report. To turn off one of the **Summary** tables and their associated graphs, select **View>Summary** from the PAVER Menu, and then select the table that you want to turn off. Tables or graphs which are active in the current report view have a check mark to the left of the table or graph's name. Other summary views include:

- **Annual Condition After Repair** - This displays the condition of each branch-and the entire network (or networks if you have more than one) AFTER the recommended work has been performed.
- **Condition Table** - This view shows a "before and after" average condition of all sections included in the current plan and for each year of the plan.
- **Total Funded / Total Unfunded** - These tables show how much money was spent (**Funded**) and how much PAVER wanted to spend, but did not have the funds (**Unfunded**). Unfunded work is also referred to as "Backlog".

- **Summary by Section** - This view shows a combination of things seen in other views, the condition of each section before and after work is performed, the type of work needed, and the cost involved.
- **Applied Policy Summary** - This is a breakdown, in summary form, of each **Maintenance Policy**, corresponding work description, and associated work quantities, and costs.

Detail View Section

Note

Data shown in the **Summary View** is branch level data while data shown in the **Detail View** is section level data.

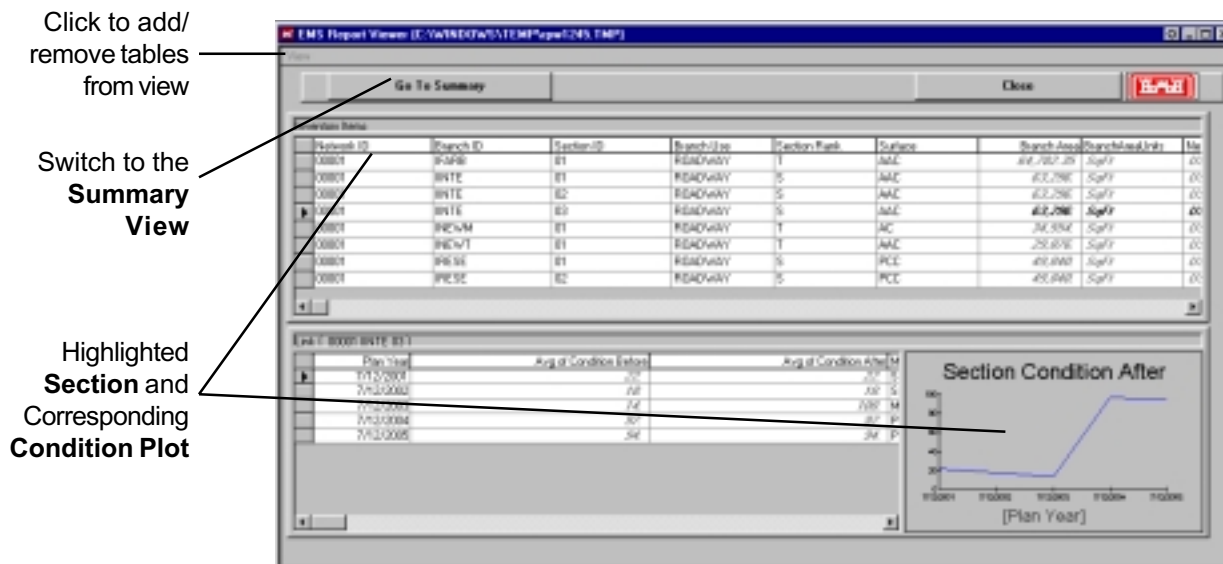
The **Detail (View>Detail)** version of the **Work Plan** includes the **Detail** table, **Applied Policy Details** table, **Inventory Items** table, **Missing Values** table, and a table listing the parameter settings used in the report. If the **Consequence Model** was requested, an additional table titled **Applied Policy Consequences** is included in the **Detail** report. Some table definitions include the following:

- **Detail Table** - A breakdown - by section - of the amount of money spent in each work category, and before and after conditions.
- **Policy Action Details** - A list of distresses encountered (from the last inspection date for each section) and work applied.
- **Detail Table by Section** - This is the Same as **Detail Table**, but it includes an associated graph displaying condition.

As with the **Condition Analysis Report**, the **M&R Report** also produces a "Select GIS Views" window that allows you to view three separate, preset GIS views associated with the current M&R Report. The preset views are:

- **"After" condition by Year** - This shows the condition of each section in the report "after" the funding (work) has been applied to that section.
- **All planned M&R by year** - show a breakdown - by year - of what types of work need to be done (according to the M&R plan) on each section.
- **Major Planned M&R by year** - same as above, concentrating only on the Major M&R work. Split into two categories: Above Critical (for sections above the critical PCI) and Below Critical (for sections below critical).

Reminder: GIS views are only available if you have linked a coverage to your database (See the chapter on GIS).



Open Saved Report

As with the **Condition Analysis** reports, you can also save any M & R plan that you run. Again, a primary advantage of doing this is saving the time it takes to execute the report. Depending on the speed of the computer and the parameters of the report and the size of the database, this could be significant. It also provides an easy quick way to compare different reports.